

PATENT COOPERATION TREATY

DIARIED

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

Griffith Hack
GPO Box 1285K
MELBOURNE VIC 3001

GRIFFITH HACK
30 APR 2004
1. *DeS.*
2. *DAB.*
3.

PCT ID. 374633.....

WRITTEN OPINION
(PCT Rule 66)

Date of mailing
(day/month/year) 29 APR 2004

Applicant's or agent's file reference
fp18328/sj

REPLY DUE within **TWO MONTHS**
from the above date of mailing

International Application No.

PCT/AU2003/001118

International Filing Date (day/month/year)

29 August 2003

Priority Date (day/month/year)

30 August 2002

International Patent Classification (IPC) or both national classification and IPC

Int. Cl. ⁷ C07H 21/04, C12Q 1/68, C12M 1/34, B82B 1/00, B82B 3/00

Applicant

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION et al

Nanotubes

1. This written opinion is the **first** drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

3. The **FINAL DATE** by which the international preliminary examination report must be established according to Rule 69.2 is:
30 December 2004

→ The applicant is hereby **invited to reply** to this opinion.

When? See the **Reply Due** date indicated above. However, the Australian Patent Office will not establish the Report before the earlier of (i) a response being filed, or (ii) one month before the **Final Date** by which the international preliminary examination report must be established. The Report will take into account any response (including amendments) filed before the Report is established. **If no response is filed by 1 month before the Final Date**, the international preliminary examination report will be established on the basis of this opinion.
Applicants wishing to have the benefit of a further opinion (if needed) before the report is established should ensure that a response is filed at least **3 months before the Final Date** by which the international preliminary examination report must be established.

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3.
For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4bis.
For an informal communication with the examiner, see Rule 66.6.

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I. Basis of the opinion

1. With regard to the **elements** of the international application:*

- ☒ the international application as originally filed.
- ☐ the description, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the claims, pages , as originally filed,
pages , as amended under Article 19,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the drawings, pages , as originally filed,
pages , filed with the demand,
pages , received on with the letter of
- ☐ the sequence listing part of the description:
pages , as originally filed
pages , filed with the demand
pages , received on with the letter of

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

5. ☐ This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed"

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-8, 10-52	YES
	Claims 9	NO
Inventive step (IS)	Claims	YES
	Claims 1-52	NO
Industrial applicability (IA)	Claims 1-52	YES
	Claims	NO

2. Citations and explanations

The following documents identified in the International Search Report have been considered for the purposes of this report:

- D1 Chen R J et al, J. Am. Chem. Soc. 2001, 123, pp 3838-3839
- D2 Tsang S C et al, Angew. Chem. Int. Ed. Engl. 1997, 36 No 20, pp2198-2200
- D3 WO 1997032571
- D4 WO 2002095099
- D5 US 2002/0172963
- D6 US 6555362
- D7 Williams K A et al, Nature 2002 vol 420 page 761.
- D8 Service R F, Science 2002 vol 298 pp 2322-2323
- D9 Hazani M et al, Nano Letters 2003 vol 3 no 2 pp 153-155
- D10 Baker S E et al, Nano Letters 2002 vol 2 no 12 pp 1413-1417
- D11 Stevens J L et al, Nano Letters 2003 vol 3 no 3 pp 331-336
- D12 Cai H et al, Anal Bioanal Chem 2003 vol 375 pp 287-293
- D13 Williams K A et al, AIP Conference Proceedings (2002) 633 (Structural and Electronic Properties of Molecular Nanostructures), pp 444-448

D4-D13 are published prior to the international filing date but later than the priority date claimed and are therefore not relevant in the consideration of novelty or inventive step. These documents may become relevant if the priority date claimed by the instant application is found to be invalid.

D1 discloses a bifunctional molecule physically adsorbed onto the surface of single-walled carbon nanotubes (SWNTs) and then linked to a protein. DNA molecules adsorbed on MWNTs via non-specific interactions were also disclosed. Given the state of the art, no inventive step can be acknowledged by attaching a different biomolecule, ie, DNA, to the carbon nanotube using its known properties. Therefore, claims 1-52 are not inventive.

VI. Certain documents cited

1. Certain published documents (Rule 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 2002095099	28 November 2002	29 March 2002	29 March 2001
US 2002/0172963	21 November 2002	9 January 2002	10 January 2001
US 655362	29 April 2003	10 October 2001	30 May 2001

WO 2002095099 discloses that non-covalently bonded molecules are configured and arranged for bonding to, for example, DNA and proteins, on SWNTs and a plurality of SWNTs are provided for the functionalisation, see page 3 lines 9-16, page 5 line 9 to page 6 line 5, page 7 lines 3-20, claim 13 and figure 1.

US 2002/0172963 discloses an array of carbon nanotubes to which biological molecules including DNA and RNA are attached.

US 655362 discloses an apparatus for determining gene sequences based on the detection of attractive force associated with specific complementary hydrogen bonding between each type of nucleotide base with a probe consisting of carbon nanotubes bound with nucleotides.

2. Non-written disclosures (Rule 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)

VEI. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. Claims 2-4 are not clear. The use of the conjunctions "or" and "and" renders the scope of the claims unclear. It is not clear what the discrete steps of the method are.
2. Claim 3 is not clear. Steps (a) and (b) appear to be identical.
3. Claim 4 is not clear. Steps (a) and (b) appear to be identical.

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V

D2 discloses the immobilisation of DNA oligomers on carbon nanotubes by adsorption. It also discloses anchoring DNA onto a solid surface so that it functions as a chemical recognition agent for complementary DNA. Given the state of the art, no inventive step can be acknowledged in attaching nucleic acid to a nanotube. Claims 1-52 are therefore not inventive.

D3 discloses methods for introducing functional groups to the surface of functionalized nanotubes and to nanotubes linked to one another. It also discloses attachment of proteins to the nanotubes, see, for example, Example 21. Other moieties that can be attached to the nanotubes are peptide, enzyme, antibody, oligonucleotide, nucleotide and antigen. Claim 9, which is directed to a plurality of linked nanotubes, is not novel in light of the disclosure. The disclosure also renders claims 1-52 not inventive.

Claims 1-52 are considered to have industrial applicability.